KNOWLEDGE ABOUT SEA-SERPENTS

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IN recent years Western society has shown a very strong interest in controversial anomalies like UFOs, the Loch Ness Monster, Bigfoot, and so forth. This resurgence of interest in possible 'deviant' phenomena has generated a large literature of varying quality, arguing for, or (in a minority of cases) against, the existence of the anomalies in question.[1] A major concern of this literature has been the quality of the evidence supporting the anomaly's existence in each case. Whether the evidence has been eyewitness testimony, physical 'traces', or instrumental records like photographs, the problem has virtually always been the same: does the evidence provide convincing proof of the anomaly's existence? There is, however, a more basic question: where does the evidence come from in the first place? How is it that we get the 'cases' over which an argument about the anomaly's existence can take place?

Specific cases or 'sightings' are of course not the only basis for deciding that a given hypothetical anomaly exists or does not exist. The state of scientific knowledge, current intellectual or scientific fashions, and cultural traditions in the form of legends or folk-tales also enter into such a decision. But specific sightings or groups of sightings are the focal point for the social negotiation of the reality of a given type of anomalous event. Hence, it is crucial to discover what the sources of these sighting reports are. If reports are indeed used as the decisive pieces of evidence, then knowing *how* reports reach us and *which* reports reach us are of the utmost importance. Elsewhere[2] the author has referred to the sum of channels by which reports reach a given decision-maker as a 'social intelligence system'. How such a system works to transmit reports of anomaly sightings will be our major concern here. The problem of knowledge about sea-serpents will be used as a specific example to illustrate the difficulties of securing information about anomalous events in general. In other papers the author has examined this problem in relation to knowledge about meteorites[3] and Unidentified Flying Objects.[4]

Sea-Serpent Sightings

For the purposes of this paper a 'sea-serpent' will be defined as any large elongate marine creature of an apparently unknown species. The word 'marine' is critical here, since it exempts fresh-water creatures like the Loch Ness Monster (usually placed under the heading of 'lake monsters') from consideration. This distinction will be used for purposes of convenience rather than from any deep philosophical motive, and is a result of the bifurcation of the literature on alleged serpentine animals into fresh- and salt-water categories.[5]

The first collection of specific sea-serpent reports, as opposed to merely legends and folk-tales, was presented as part of Bishop Erich Pontoppidan's *Natural History of Norway*.[6] The controversy began in earnest, however, with the American sightings of 1817-19, off the Massachusetts coast. Repeated sightings led to crowds of observers at the shore and even expeditions to capture the monster. The American sightings led to the first articles in scholarly journals and an official report of the Linnean Society of Boston.[7] The 'American sea-serpent' also began to be observed by the British in 1848 with a well-publicised report of an animal seen from H.M.S. *Daedalus* and by the end of the nineteenth century, when interest in it began to fade, it had long since assumed an international character. A running scientific controversy over the existence of 'the great sea-serpent' continued throughout the nineteenth century. Although sightings continued steadily into the twentieth century, the scientific controversy lost its momentum around 1900. The sea-serpent continued on in popular culture, however, as a symbol of the *canard* or contrived sensational event.

Our concern here is not so much with the scientific controversy *per se,* however, as with the origin of the data which fuelled the controversy. What we will do will be to take the currently available stock of sea-serpent reports and study the way in which these reports have become public. In the process we will gain some insight both as to the nature of the experiences represented by the reports and the channels by which these reports have been transmitted to us. The stock of reports we will use is that represented by Bernard Heuvelmans's definitive work, *In the Wake of the Sea-Serpents*.[8] Heuvelmans's book, which contains reports of 587 sightings, represents the most exhaustive effort to date to collect the scattered reports of sea-serpent sightings from available sources. By examining the sources

of the reports that Heuvelmans used, we can begin to form an idea of how scientists become aware of data about anomalous events like sea-serpents. What will emerge from this examination is a picture of a very complex system of data transmission, unorganised and inefficient, but which is nonetheless responsible for our current knowledge of these hypothetical animals.

It would seem from Heuvelmans's data that sea-serpent sightings occur at an average of about three per year, a rate that has remained steady since 1800 (see Table I).[9] An individual year, of course, may have many more reports or none at all. That the average has remained steady is nonetheless remarkable, in view of the enormous growth of population and communications since 1800, both of which could be expected to swell the number of sightings. For reasons which will soon become clear, this statistic is difficult to interpret, and could be due to: 1) a smaller number of experiences of a 'sea-serpent' kind 2) a decreasing propensity to report such experiences 3) fewer of the types of animals which are labelled 'sea-serpents' 4) fewer contacts between such animals and human beings or 5) some combination of these factors.

TABLE I

Number of Sea-Serpent Sightings Per 50-Year Period

Before 1800	1801-1850	1851-1900	1901-1950	1951-1966
32	166	152	190	47

TOTAL: 587
Source: Heuvelmans (1968)

The sightings catalogued by Heuvelmans represent a great diversity of experiences. In many cases, a report was made of a sighting by a single observer, either on land or at sea; in some cases two or more persons on board a vessel participated in the experience; in a minority of cases large crowds on shore witnesed what seemed to be a large serpentine creature. In the American sightings of 1817-19 a strange creature was repeatedly seen off the Massachusetts coast, often by 'hundreds of witnesses'. In some cases the crowds had gathered expressly to see the 'monster'. James Prince, a District Marshal,

stated that on one occasion in 1819 he and about two hundred other witnesses watched a sea-serpent off Nahant, Massachusetts for more than three hours.[10] In other cases the sightings were of very brief duration. Thus there is no single 'pattern' which such sightings follow.

How should we regard these sightings? Are they instances of human credulity, the 'will to believe', optical illusions, or veridical experiences with creatures unknown to naturalists? Certainly some of the experiences are difficult to dismiss as the result of simple fraud; many of the early sightings in the United States were sworn before a Justice of the Peace, or in a court of law. In some cases the reputations of the witnesses seem to rule out fraud as a reasonable explanation. But the possibility of optical illusion is present even with witnesses of unimpeachable character. Especially in situations in which the concept 'sea-serpent' was known to the observers, how can we be sure that the witnesses were not the victims of a kind of perceptual contagion?[11] The possibility of perceptual contagion cannot be ruled out in all cases, but certain features of some cases make it seem very unlikely.

The first such feature is the 'escalation of hypotheses' noticed by Hynek[12] and earlier by Carrouges[13] in many Unidentified Flying Object sightings. This term refers to the tendency of the anomaly witness to see the stimulus initially as something non-anomalous. It is not unusual for a sea-serpent sighting to begin with the object being perceived as a log, a rock, or an overturned boat. It is seen as a sea-serpent only after other perceptual hypotheses have been tried and found wanting. The report of a sea-serpent sighting by the Rev. Donald Maclean illustrates this pattern:

> '. . . I saw it in June 1808 not on the coast of Eigg, but on that of Coll. Rowing along that coast, I observed, at the distance of about half a mile, an object to windward, which *gradually excited astonishment*. At first view it appeared like a small rock. Knowing that there was no rock in that situation, I fixed my eyes on it close.
> Then I saw it elevated considerably above the level of the sea, and after a slow movement, distinctly perceived one of its eyes. Alarmed at the unusual appearance and magnitude of the animal, I steered so as to be at no great distance from the shore . . .' (my emphasis).[14]

Bruner states in his well-known essay on perceptual readiness[15] that the facility with which something is perceived is related to its expected probability of occurrence. Since sea-serpents are hardly a common occurrence, we would expect them to be perceived only with difficulty.

In other cases there is no 'escalation' but it is apparent that more

than simple perceptual contagion is involved. In the James Prince sighting mentioned earlier, Prince noted that

> 'The first view of the animal occasioned some agitation, and the novelty prevented that precise discrimination which afterwards took place . . . after being accustomed to view him, we became more composed . . .'[16]

Prince claimed that he had at least a dozen distinct views of the animal, and indicated that he had been 'accustomed to see whales, grampuses, porpoises, and other large fishes'[16a] hence was reasonably confident that the animal was of an unknown kind. In regard to the same sighting Samuel Cabot said

> 'I was now satisfied that the *sea-serpent* was before me, and after the first moment of excitement produced by the unexpected sight of so strange a monster, taxed myself to investigate his appearance as accurately as I could.'[17]

Hence even when there is considerable emotion involved in a sea-serpent experience, this does not mean that the perceptions involved have an entirely contagious character.

Another feature of interest is the use of 'critical checks' by the percipient during an anomaly experience. In his study of the public reaction to the Orson Welles 'Invasion from Mars' broadcast of 1938, Cantril found that belief in the reality of the 'invasion' was influenced by lack of what he called 'critical ability'.[18] Briefly, critical ability referred to the use of checks on the validity of one's own perceptions. Many of those who heard the broadcast made checks on its authenticity either by using the internal evidence of the broadcast itself or by checking the social context for counter-indications, such as routine programmes on other channels. Those who did not perform such critical checks, even when they were of a high educational level, believed that the play was indeed a news broadcast and that the Martians were actually landing. The use of critical checks by sea-serpent 'sighters' similarly might result in the unmasking of optical illusions, and in any case are indications that the witness is concerned about the accuracy of his own perceptions.

In 1908, Vice-Admiral R. H. Anstruther observed a strange creature shoot out of the water while he was standing on the bridge of H.M.S. *Caesar*:

> 'I had never seen such a creature before in all my long experience at sea, so I hastily called the navigating officer, who was at the standard compass, to come to my end of the bridge, in case the reptile, or whatever one may call it, should show itself again.'[19]

Calling for additional observers is a common form of perceptual check in many sightings. In another case, F. W. Kemp, an officer of the Provincial Archives of British Columbia, saw what he called a sea-serpent near Chatham Island. To make sure he had correctly perceived the creature's length, he measured some logs against which he had been able to compare the creature, and found that he had been correct.[20] The use of perceptual checks in these and other cases suggests that some sea-serpent witnesses were very much concerned with the accuracy of their own perceptions.

It is quite another matter, however, to argue that there really *are* such large elongate creatures unknown to science, and it is not intended to do so here. Our aim is to establish merely that these cases might possibly be of interest to scientists in the same way that ball lightning cases are of interest to them, even though many scientists are not sure that ball lightning exists.[21] In what follows we will not assume that sea-serpents exist but only that there exists in society a stock of 'sea-serpent' experiences or 'sightings' which naturalists and others might be interested in studying. We must now consider how these experiences travel from percipients to society at large and how some of them come into the hands of scientists.

The Reporting of Sea-Serpent Experiences

It is very important for the collection of anomaly data that individual cases become public at some point. Although there are some cases in which percipients correspond directly with anomaly researchers, as we shall see, it is much more frequently the case that data on anomalies are collected from public, printed sources. How does a percipient's experience get into print? Probably the most common channel is newspaper reporting. A reporter or editor hears of a sighting and prints the report, with or without an interview with the percipient. A less frequently used channel is the scientific periodical. A scientist, usually a naturalist, will hear of a report, investigate it himself, or in some cases will actually be the percipient, and the report will become printed in a channel which is likely to call it to the attention of other scientists. Other major sources are non-scientific periodicals, autobiographies, local history books, and books specifically on the subject of sea-serpents (see Table II).

To enter any of these channels, however, the experience must be made public by the percipient. In some cases the percipient himself

goes directly to the channel, but often the report becomes public only when the percipient mentions the sighting to members of his primary group, who then pass it on to a wider public.

TABLE II

Preliminary Channels of Sea-Serpent Reports

Newspapers	48%	(209)
Scientific Journals	18%	(80)
Non-Sea-Serpent Book ...	14%	(59)
Book on Sea-Serpents ...	13%	(57)
Magazine	6%	(28)
Television	1%	(4)
TOTAL	100%	(437)

Whether or not the primary group serves as an incubator for the report, however, the percipient must still tell others of his experience. And in some cases the primary group will recommend against making the report public or will agree not to divulge it. There is thus a problem at the very source of the report: the percipient may not wish to make his experience public. He may decide to tell no one else, to avoid even the reactions of his friends; or he may decide that while his friends can be trusted with the experience, a wider public might be less willing to believe his account. As one author has noted[22] certain categories of experience may not be acceptable to others, and a person having such an experience may be subjected to social sanctions if he persists in asserting the reality of his experience. Ridicule is often used to sanction reporters of anomalous experiences, and percipients who wish to avoid ridicule may well decide to keep their experiences to themselves.

Some percipients do decide to publicise their experiences or may find them publicised for them. Sometimes they do so because they naively think they will be believed. It is possible to read in some reports sentences like 'All doubts may now be set at rest about the great sea-serpent'.[23] Yet never is the report so convincing that doubts are in fact set aside. Usually the percipient is considered a hoaxer or a fool. In 1875 Captain George Drevar, from whose ship the *Pauline* a sea-serpent had been sighted, was ridiculed by the press. He complained that

> 'It is easy for such a paper to make any man, good, great, or interesting, look ridiculous. Little wonder is it that my relations write saying that

> they would have seen a hundred sea-serpents and never reported it; and a lady also wrote that she pities anyone related to anyone that had seen the sea-serpent.'[24]

Similarly, in a book of reminiscences by Vice-Admiral H. L. Fleet, he states that

> 'At last we . . . returned to Bermuda. On the passage Moubray and I saw what we considered to be a sea-serpent, but decided to say nothing about it, having due regard to the scepticism of the British public . . .[25]

The late Commander Rupert Gould indicated in his book on the sea-serpent that he personally knew five naval officers who had seen at one time or another what they considered to be sea-serpents, but who had decided that the best course was to say nothing about them.[26] And indeed such behaviour is very prudent, as many histories of ridiculed witnesses show. How many experiences are supressed due to the fear of ridicule is difficult to estimate, although it seems likely that a great many, probably the majority, are never reported at all.

Nor is there any certainty that a sighting will be published even if a report is made. Newspapers may wish to avoid ridicule themselves and scientists may be even more sensitive about associating themselves with such a 'crackpot' subject. On the other hand, it is often suggested that it is precisely newspapers which are responsible for the spate of sea-serpent reports during the summer, the 'silly season':

> 'In the dull season of the year, when there is a decided lack of interesting or startling events, and when newspaper editors are at their wits' end for material, three objects derived from the domain of the biologist have been credited with the task of reviving the tide of public interest, and of restoring peace and composure to the editorial mind. It need hardly be said that the three objects alluded to are: "the frog from the solid rock", "the gigantic gooseberry", . . . and the "reappearance of the great sea-serpent."'[27]

Of course, summer may not be the only dull season of the year for newspaper editors, but since it is often believed by the public that summer is such a 'silly season', let us examine what relation sea-serpent sightings have to summer-time.

From the data in Table III (first row) it is obvious that, of the *sightings* contained in Heuvelmans, summer is by far the most heavily charged season—more in this case than the other three seasons combined. Interestingly enough, this is just what one would predict on the basis of old Norwegian tradition: according to Pontoppidan,[28] the great sea-serpent was seen in Norway only on days when the weather was calm in July and August. The 'silly season' theory,

TABLE III

Season of Sightings of and Articles on The Sea-Serpent

	Season				
Season of Sea-Serpent Sightings (Northern Hemisphere)	Summer 53% (185)	Fall 20% (69)	Winter 12% (40)	Spring 15% (53)	Total 100% (347)
Season of Newspaper and Weekly Magazine Articles on the Sea-Serpent (Northern Hemisphere)	25% (83)	33% (108)	14% (46)	28% (91)	100% (328)

however, argues that it is newspaper *articles* about the sea-serpent which are most likely to appear in summer, not the actual creatures. Looking at the dates of all the newspaper and magazine articles cited in Heuvelmans (Table III, second row), we find that summer is by no means the most popular season for stories on the sea-serpent. The case for harassed editors seems even weaker when we consider Table IV, which shows that sightings tend to be attributed to summer even by those media (like books) which are relatively insensitive to season of publication. So sea-serpent sightings do tend to be a summer phenomenon, but not through the needs of newspaper editors. Of course, if one wishes to consider that editors may have a dull season at other times of the year, then perhaps the 'silly season' theory is still tenable; but this idea is difficult to test.

TABLE IV

Source vs. Season of Sighting

	Winter	Spring	Summer	Fall	TOTAL
Newspapers	14% (25)	18% (33)	44% (79)	23% (42)	99% (179)
Scientific Journals	2% (1)	13% (6)	72% (34)	13% (6)	100% (47)
Non-Sea-Serpent Book	7% (2)	7% (2)	70% (19)	15% (4)	99% (27)
Sea-Serpent Books	10% (4)	12% (5)	67% (27)	10% (4)	99% (40)
Magazine	15% (3)	25% (5)	20% (4)	40% (8)	100% (20)
Television	0	0	50% (1)	50% (1)	100% (2)

There is another way in which newspaper and magazine articles *are* very important to sea-serpent reporting: the report release phenomenon. It is not unusual in anomaly reporting to have a delay, often of several years, between the experience and a report of it in some public channel. Often the occasion for the release is the publication of an autobiography or other material of a historical nature; but more commonly, it is the publication of *someone else's* report. This phenomenon, report release, is most strongly evident after the publication of an article on sea-serpents, *e.g.* in a popular magazine. Readers of the article who have had sightings themselves often write to the author of the article, detailing their own experiences. This not only creates a greater store of data in the author's possession, but frequently means that more reports will be published in the same channel. It encourages an individual who has not reported his own sighting to think that others are having the same experiences.

An example of report release is the response to an article by Sanderson in the *Saturday Evening Post,* 'Don't Scoff at Sea Monsters'.[29] As a result of this article, Sanderson received at least nine new reports, the median age of which was twelve years. The oldest was 46 years old.[30] A 1961 television panel discussion in England by the British Broadcasting Corporation elicited seven reports of comparable vintage.[31] An even clearer picture of the delays involved in reporting can be gained from consideration of the more than 30 reports from the Vancouver, British Columbia area.

Although the first sightings from this area date from 1912, the first public recognition of the phenomenon occurred in 1933, when two Canadian government officials indicated that they had seen the creature, which was quickly dubbed 'Cadborosaurus'. These two reports quickly released a flood of older ones, involving around a hundred witnesses. The atmosphere created by this publicity also insured good reporting for the next two decades, for sixteen sightings were reported between 1933 and 1969. Even so, a 1912 sighting did not reach public attention until the 1960s, and a 1928 sighting did not emerge until 1954.[32]

Articles on sea-serpents in scientific journals also tend to release more cases. This release can occur even if the articles which act as releasers indicate a negative attitude towards the reality of the sightings. Persons believing that they have observed sea-serpents may write to those with neutral or negative views either in an attempt to

persuade them to change their opinions or from a desire that their sightings be satisfactorily explained. To be sure, authors whose views are negative may be less likely to publish the new cases they get than those with positive views would be, and these cases may not be transmitted any further. In some cases, however, the communications may be addressed to the journal itself rather than the author of the article, and may be printed by the editor. For instance, the British scientific journal *Nature* printed nineteen separate contributions on the sea-serpent from 1872 to 1885.[33] Some of these were sightings sent in to confute articles with negative views. In general, then, writings on the sea-serpent tend to generate new cases, even if the writings are negative.

How many of the reports in our sample were released by the publication of other reports, we do not know. We do know that at least ten percent of the reports were admittedly released only after someone's sighting. But when one considers reports which were released because there had been a recent sighting, or which were released only in conjunction with another sighting, or during 'flaps', one could easily estimate that only a third or less of the sightings were 'independently' released. And very few of these latter would have been released at all if the words 'sea-serpent' did not exist as a convenient label to describe these experiences.[34]

TABLE V

Class Composition vs. Number of Observers*

No. of Observers	Upper-middle or higher	Middle class	Lower class	Totals
1	64% (25)	8% (3)	28% (11)	100% (39)
2	61% (51)	26% (22)	13% (11)	100% (84)
3	46% (25)	20% (11)	33% (18)	99% (54)
4	33% (14)	19% (8)	49% (21)	101% (43)

*Any assignment of observers to social classes, which was done in this case by occupation, must remain extremely rough. How is one to assess the status of a Tasmanian mining engineer vs. that of a steamer's third officer? Or for that matter, the Grand Huntsman to the King of Sweden? Thus the validity of each identification of a given occupation with a class status is problematic. Overall, however, the general tendencies are clear.

Finally, individual characteristics such as the percipient's social class affect reporting. Higher class individuals are more likely to have access to means of communication and their social position is likely to command more respect.[35] Their superior education is also likely to manifest itself in a greater confidence that they can distinguish a genuinely anomalous stimulus from a non-anomalous one. These three factors are likely to contribute to a disproportionately higher *reporting* rate for the higher classes although the *sighting* rate is probably the same for all classes. In Table V we find that the accuracy of this hypothesis depends on the size of the group involved in the sighting: the smaller the group, the more important higher class position is. A similar finding is indicated in Table VI, where sightings from ships are broken down into categories by status of reporter. In those cases where the reporters are identified, captains and officers are by far overrepresented. The sightings in which only captains and other officers are included is in fact 27 per cent of the total sightings from ships. Even in the most favourable interpretation of the other cases, this suggests a higher reporting rate for officers.[36]

TABLE VI

Sightings From Ships—Status of Reporters

Captain only	11%	(20)
Captain and officers only	16%	(29)
Seamen only	5%	(8)
'Ship's crew'	57%	(100)
Unknown	11%	(19)
TOTAL	100%	(176)

We see, then, that the reporting process is strongly affected by social factors—the fear of ridicule, the publication of the reports of others, and the social position of the percipient. Even if a percipient wishes to make a report there is no guarantee that it will be published—so it may never enter a public channel. It is thus very unlikely that public reports are a random sample of experiences. It is equally unlikely that the temporal pattern of reporting reflects the temporal pattern of sighting. As we have seen, sightings tend to occur in the summer months. From our data on channels it would appear that newspapers, far from concentrating reports in summer, tend to disperse them throughout

the year, although there is a low point in winter. The report release phenomenon often causes reports to follow one another closely in time—although the sightings may be temporally far apart. Still, there are a few periods in which a large number of sightings occur in a relatively short period of time, as in the Massachusetts sightings of 1817-19.[37] There are thus both waves of sightings and waves of reports: but a wave of reports can occur in the absence of a wave of sightings, through the report release process.[38]

The Expanding Data Base

The report release process expands the data base of sea-serpent sightings. As we have seen, released reports may become public directly or they may end up in the hands of authors of sea-serpent articles and books. As time goes on, more and more cases are available for study. As the number of cases increases, however, the necessity for a catalogue of cases, especially a critical catalogue, increases. The two most ambitious efforts in this direction have been Oudemans[39] and Heuvelmans.[40] The work of later compilers has been greatly assisted, of course, by the labours of earlier ones. Heuvelmans has indicated that he spent six years of uninterrupted labour writing the first (1965) edition of his work.[41] Without the previous efforts of earlier compilers, especially Oudemans, however, his book would have included many fewer cases.

TABLE VII

Growth of Data Base

Date of Compilation	Number of Cases Included	Cases previous to date which were available in 1976*
Pontoppidan (1755)	11	(16)
Linnean Society (1817)	31	(62)
Oudemans (1892)	189	(318)
Heuvelmans (1965)	548	(615)
Heuvelmans (1968)	587	(615)
Heuvelmans (1976)	615	

*Based on list given in Heuvelmans 1976.

The growth of the stock of sea-serpent cases is shown in Table VII. The numbers in parentheses indicate cases prior to the date of the

compilation which were available in 1976. The difference between the number of cases available now and the number of those actually included in a compilation is due to the joint effects of report release and intensive search by researchers. Even the different editions of Heuvelmans's book show the growth of the data base. Between his 1965 and 1976 editions, for instance, his catalogue grew from 548 to 615, a twelve percent increase. And new reports continue to turn up.[42]

One might think that with this expanding number of reports, there would be an increasing inclination on the part of naturalists to investigate them. This is not the case, however. We will now consider why this expansion of data has not led to an expansion of interest.

Scientists' Evaluation of Sea-Serpent Reports

It is ironic that a growing stock of reports of sea-serpent sightings has been accompanied by a declining interest in the subject on the part of naturalists. In the nineteenth century supporters of the sea-serpent's existence included many of the great naturalists of the time: Sir Joseph Banks, Benjamin Silliman, Louis Agassiz, and Thomas Henry Huxley. The sea-serpent also had many well-known detractors, like Richard Owen, William Mitchill, and Sir Charles Lyell.[43] On the whole the intellectual climate was at least one of an interested neutrality, if not actually favouring the existence of the hypothetical monster. In the twentieth century it is hard to find naturalists interested in the problem at all, and very few write about it. Let us speculate on the reasons for this state of affairs.

The increasing data base has had relatively little effect on scientists' interest in sea-serpents. Instead, scientific interest has tended to focus on the Loch Ness Monster, a much more tractable problem.[44] Loch Ness is a relatively small body of water, sightings are frequent, and there are a fair number of photographs of the supposed 'monster'. Because the area of the Loch is relatively limited, one can employ sonar and underwater stroboscopic cameras to detect and record possible passages of the creature.[45] The instrumental records may not be as satisfactory as a carcass, but at least the naturalist does not have to depend completely on eyewitness accounts. With the sea-serpent, on the other hand, none of these advantages exists. With the exception of the probably fraudulent Le Serrec films,[46] there is no extant photograph of a sea-serpent. Sea-serpent sightings are infrequent and unpredictable, and eyewitness accounts are the only source of data. Re-

gardless of the number of cases, the data simply are not very satisfactory. Few of the witnesses have had any training in zoology and they are almost always caught unprepared (which may account for the lack of photographs). Many naturalists would probably agree with the assessment of Richard Owen, one of the nineteenth century's most eminent anatomists, in regard to the sea-serpent sighting from H.M.S. *Osborne*:

> '. . . remarks thereon by observers not conversant with natural history, and so situated, preclude the formation of any opinion worth recording of the nature of the object or objects causing the phenomena as interpreted by the foregoing witnesses.'[47]

Nor does there seem to be any single common feature which one could use to distinguish the genuine sea-serpent reports from the spurious ones. Many reports describe creatures so different from those in other reports that they simply could not be of the same species. Heuvelmans,[48] who strongly believes that sea-serpents exist, solves this problem by positing at least *seven* different types of animal.[49]

Then there is the problem of hoaxes. It seems clear that there have been a number of reported sightings which were definitely fraudulent;[50] and many others which have been treated as genuine are probably also fraudulent. The perceptual errors and ignorance to which Owen referred are bad enough, but when the possibility of outright fraud is added, sea-serpent investigation is not likely to seem promising to naturalists. Samuel Mitchill, one of the founding fathers of American science, felt that so many sea-serpent hoaxes had been perpetrated that the subject was scarcely worth consideration.[51] Even in the cases where the witnesses' characters would seem to preclude a hoax, there is still the possibility of optical illusion:

> 'Now, after all these mistakes, deceptions and wilful perversions on the subject, every person of consideration may admit that the gambols of porpoises, the slow motions of basking sharks and the yet different appearance of balenoepterous whales, all of which have fins on their backs, may have given rise to those parts of the narrations, not already herein commented upon.'[52]

The 'data' are thus likely to seem tainted by deception and error, and difficult to decipher, in any case. If it is so difficult to prove that the Loch Ness Monster exists, how much more difficult is it to prove the existence of the 'great unknown' of the seas! Naturalists are not likely to look at sea-serpents as a soluble puzzle. They are therefore unlikely to expend their energies in trying to solve it.[53]

Research does not take place in a social vacuum, however. Sea-

serpents, like the Loch Ness Monster, are a subject on which the public's motives for desiring scientific research are not likely to make the subject appealing to scientists. Suspicion of two motives in particular is likely to create considerable reluctance on the part of scientists to involve themselves with sea-serpents: the public's romantic interest in their existence and its desire to embarrass 'the experts'. In regard to the first motive, let us consider Richard Owen's remarks on the *Daedalus* case. In commenting on the sighting of an alleged sea-serpent from H.M.S. *Daedalus*, Owen stated that if it could be shown that the animal seen was not a saurian,

> 'It destroys the romance of the incident, and will be anything but acceptable to those who prefer the excitement of the imagination to the satisfaction of the judgement.'[54]

For his work in the debunking of the *Daedalus* sighting Owen was hailed by his colleagues as 'the killer of the sea-serpent'.[55] Scientists rightly suspect that the sensational and mysterious aspects of anomaly sightings are very attractive to the public and detract from the interest which they feel the public should have in more routine 'popular science'. The press's ridicule of witnesses also serves to discourage scientific interest, as scientists hesitate to involve themselves with a subject having such non-serious overtones.

The second motive is no less strong, even if it is characteristic of a much smaller group. Science is the dominant intellectual enterprise of our time and there are few areas of life which it does not affect. In this way, natural science is to the twentieth century what the Church was to the Middle Ages. The limited nature of scientific expertise is often neglected both by persons inside and outside science, and scientists are sometimes regarded as infallible experts on the earth and the cosmos. As Dixon[56] has observed, however, there are many persons in modern society who resent this posture of infallibility, and accordingly welcome occasions upon which scientific expertise is shown to be in error. Since scientists are likely to express negative opinions about deviant phenomena like sea-serpents and UFOs, any indications that reports of these phenomena might be well-founded are welcomed by this group. If scientists could be forced to change their opinion about the reality of sea-serpents or the Loch Ness Monster, this would be seen as a major victory by those who feel that science has become too arrogant in its own authority.[57]

The existence of these motives and related ones means that the

existence of sea-serpents is not merely an intellectual question, but an emotional one as well. The prestige of science and the hopes of the public are staked on different outcomes in the controversy. If sea-serpents are accepted by science, this would prove that science has been wrong. It would also mean that the public's romantic belief in the 'great unknown' was justified.[58] These concerns are likely to affect any scientific evaluation of the creature's existence. In addition, as we have seen, the subject is not a very promising one from the standpoint of the data, and a naturalist who invests his time in the area is likely to get little support and encouragement from his colleagues or from the scientific community at large. It is hardly surprising, therefore, that the growth of the data base has not meant a comparable growth of interest on the part of scientists.

This attitude, in turn, is responsible for a continuing scepticism vis à vis sea-serpents by the press, which derives its attitudes (in part) from what it believes the attitude of the scientific community to be. Percipients are unlikely to report sightings because they know what the public reaction to the report is likely to be, and how their sighting is likely to be reported in the press. The system, then, is reflexive to the extent that scientists' attitudes towards sea-serpents influence the rate of reporting of sightings. There is a kind of self-fulfilling prophecy inherent in the pronouncement that 'sea-serpents do not exist', since the pronouncement can inhibit the transmission of information that might indicate otherwise. What we find out about sea-serpents is determined in part by what we already believe to be the case.

Conclusion

In considering the social transmission and accumulation of data about anomalies like sea-serpents, we confront a rather unusual system of knowledge production. Individuals or groups have sightings of what they believe to be large unknown marine creatures. In some cases these sightings are reported, often after a long delay, and are then printed in public sources. Cases from these sources are gradually assembled into catalogues which provide a resource for interested researchers. Not many naturalists become interested in the data, however, since observations have not been gathered systematically, nor do the observers usually have any technical training. In addition, public attitudes towards sea-serpent reports discourage rather than encourage scientific interest. The lack of scientists' acceptance of the reality of

sea-serpents in turn tends to inhibit reporting.

Our knowledge of sea-serpents, then, depends upon this diffuse system of social intelligence and especially on the efforts of those few naturalists, like Oudemans and Heuvelmans, who decide that the imperfections of the data are less important than the subject's intrinsic interest. Those who interest themselves in sea-serpents are likely to receive few rewards from the scientific community for their work, unless (like Owen) they seek the data only to debunk it. Yet the information continues to grow, in fits and starts to be sure, but it does grow. Should, by some miracle, a sea-serpent carcass or some significant portion thereof be discovered, a considerable documentation will already be found to exist. Should no such convincing piece of evidence be found, our successors may well conclude that the collection and processing of such 'evidence' was the work of scientific Quixotes.

It is well to consider, though, that many other anomalies may be subject to the same social relations as sea-serpent reports. In my earlier work on UFOs and meteorites[59] I have demonstrated that very similar difficulties are likely to be present in the collection of information about other events which violate current scientific doctrine. These difficulties may be interesting to sociologists, but they are frustrating to scientists who develop an interest in a type of event considered impossible or implausible. In some cases the difficulty may be so severe that even a researcher strongly interested in a given anomaly may not be able to find data on it, because the data have never been collected. Even in the computerised world in which we live it may be hard to retrieve data on events like sea-serpent sightings because the system of social intelligence is so imperfect.[60]

It must also be remembered that the average scientist, in making a decision about an anomalous event, may not engage in any systematic data search at all, but may base his decision on those few cases which come to his attention. The fact that this sample may be unrepresentative and may not contain some of the most interesting cases may seem irrelevant, since the anomaly may be a relatively low priority in his research anyway. He may not even realize that compilations of similar cases exist and might regard them as irrelevant if he were aware of them. This indifference to anomaly information is a major factor in its non-dissemination.

Anomalies share with a number of other types of events the property that reporting is highly responsive to social demand. One thinks

immediately, for instance, of crimes,[61] concentration camps,[62] and air safety problems.[63] The marketing of news often takes public demand into consideration[64] and organisational intelligence tends to be strongly influenced by what those higher up in the organisation want to hear.[65] In all these areas, however, the fact that transmission of reports is tied to the demand for them is often forgotten when the reports are being evaluated. This tendency to forget social factors in transmission can result in an incorrect assumption that a paucity or absence of reports indicates that nothing is happening. Likewise, a 'flap' of reports may erroneously indicate that a sudden increase in the rate of the events in question is occurring.

In considering what we know about certain types of events like sea-serpent sightings, it may be well to consider explicitly the social processes responsible for our awareness of these events. There is a natural tendency on our part to assume that reporting is more complete and representative than often is the case.[66] With a more realistic understanding of how information about such events is generated we can make a sounder evaluation of what the data mean, and what kind of evidence they provide for the existence and nature of the events in question.

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[1] For a partial review of this literature, see Ron Westrum: 'A Note on Monsters', *Journal of Popular Culture*, Vol. 8, No. 4, 1975, pp. 862-70.

[2] Ron Westrum: 'Science and Social Intelligence about Anomalies: The Case of Meteorites', paper presented at the meetings of American Sociological Association, Chicago, Illinois, October 1977a.

[3] ibid.

[4] Ron Westrum: 'Science and Social Intelligence About Anomalies: The Case of UFOs', *Social Studies of Science*, Vol. 7, No. 3, 1977b.

[5] For a review of the literature on sea-serpents, see B. Heuvelmans: *In the Wake of the Sea-Serpents*, Hill and Wang, New York, 1968; for a review of the literature on lake monsters, see Peter Costello: *In Search of Lake Monsters*, Coward McCann and Geoghegan, New York, 1974.

[6] Erich Pontoppidan: *The Natural History of Norway*, A. Linde, London, 1755, 2 vols.

[7] Linnean Society of Boston: *Report of a Committee of the Linnean Society of Boston Relative to a Large Marine Animal Supposed to be a Serpent Seen near Cape Ann, Massachusetts, in August* 1817, Cummings and Hilliard, Boston, 1817.

[8] Heuvelmans: op. cit., 1968. Data from the 1968 edition were used for purposes of analysis. Additional data are contained in the 1976 edition, but it arrived too late for the data to be incorporated in the present paper.

[9] It is evident from the new cases that are being discovered that this is an underestimate, but it will have to serve for the present.

[10] Cornelius A. Oudemans: *The Great Sea-Serpent,* E. J. Brill, Leiden, 1892, pp. 206-209.

[11] See Westrum: op. cit., 1977b, for a discussion of perceptual contagion.

[12] J. Allen Hynek: *The UFO Experience: A Scientific Enquiry,* Regnery, Chicago, 1972, p. 13.

[13] M. Carrouges: *Les Apparitions des Martiens,* Arteme Fayard, Paris, 1963, pp. 188-95.

[14] Oudemans: op. cit., p. 151.

[15] Jerome Bruner: 'On Perceptual Readiness', *Psychological Review,* Vol. 64, 1957, pp. 123-52.

[16] Oudemans: op. cit., p. 207.

[16a] ibid., p. 208.

[17] ibid., p. 210.

[18] Hadley Cantril: *The Invasion from Mars,* Harper and Row, New York, 1966, pp. 112-24.

[19] Heuvelmans: op. cit., 1968, p. 385.

[20] ibid., p. 442.

[21] Stanley Singer: *The Nature of Ball Lightening,* Plenum Press, New York, 1971; Eugene Garfield: 'When Content Analysis Strikes Ball Lightening', *Current Contents,* Vol. 8, No. 20, 1976, pp. 5-16.

[22] Jeff Coulter: 'Perceptual Accounts and Interpretive Asymmetries', *Sociology,* Vol. 9, No. 3, 1975, pp. 385-96.

[23] Oudemans: op. cit., p. 321.

[24] Heuvelmans: op. cit., 1968, p. 225.

[25] Rupert Gould: *The Case for the Sea-Serpent,* Philip Allan, London, 1930, p. 189.

[26] ibid.

[27] Andrew Wilson: *Facts and Fiction of Zoology,* Humboldt Library of Popular Science Literature, No. 29, Vol. 2, J. Fitzgerald, New York, 1882, p. 12. It says something for the persistence of interest in the 'great unknown' that it is still familiar to the readers of this article, while most of them will find the other two objects somewhat obscure.

[28] Pontoppidan: op. cit., Vol. II, p. 196.

[29] Ivan T. Sanderson: 'Don't Scoff at Sea Monsters', *Saturday Evening Post,* 8 March 1947, pp. 22-3, 84-7.

[30] Heuvelmans: op. cit., 1968, p. 508.

[31] ibid., p. 495.

[32] ibid., pp. 441-5.

[33] References will be supplied by the author on request; they are too numerous to list here.

[34] The author is strongly of the opinion that anomalous experiences which are believed to be unique are seldom reported. It is bad enough for the percipient that the experience is anomalous in the first place. When similar experiences have not been shared by others, however, the percipient is in an even worse situation, since he lacks the cognitive support that others' experiences would provide.

[35] Bentham speaks of 'a witness belonging to a higher class of a condition which presumes a more careful education, a greater responsibility, more sensibility to honour, in a word, a known witness . . .', J. Bentham: *A Treatise on Judicial Evidence,* J. W. Paget, London, 1825, p. 39.

[36] It is true, of course, that officers have duties which more often include surveillance of the ship's environment, and generally have more access to telescopes, binoculars, etc. Even so it is hard to credit the difference in reporting rate entirely to this factor.

[37] Gould: op. cit., pp. 29-72.

[38] 'Crime waves' are also generated as much by changes in the parameters of the reporting process as by actual increases in the amount of crime. For an example, see L. Steffens: *The Autobiography of Lincoln Steffens,* Literary Guild, New York, 1931, pp. 285-91.

[39] Oudemans: op. cit.

[40] B. Heuvelmans: *Le Grand Serpent de Mer,* Plon, Paris, 1965; op. cit., 1968; and, *Le Grand Serpent de Mer,* Plon, Paris, 1976, 2nd edn.

[41] B. Heuvelmans: personal communication, 6 May 1977.

[42] New cases are still being discovered in nineteenth century newspapers by Gary Mangiacopra: 'The Great Unknowns of the Nineteenth Century', *Of Sea and Shore,* 1976-7 (Winter), pp. 201-6, 228.

[43] Heuvelmans: op. cit., 1968, pp. 23-44.

[44] Maurice Burton: *The Elusive Monster,* Rupert Hart-Davis, London, 1961; Roy Mackal: *The Monsters of Loch Ness,* Swallow Press, Chicago, 1976.

[45] Mackal: op. cit.

[46] Heuvelmans: op. cit., 1968, pp. 531-5.

[47] Gould: op. cit., p. 165.

[48] Heuvelmans: op. cit., 1968.

[49] ibid., pp. 537-73.

[50] Oudemans: op. cit., pp. 12-59.

[51] W. L. Mitchill: 'The History of Sea-Serpentism', *American Journal of Science and the Arts,* Vol. 15, 1829, pp. 351-61.

[52] ibid., p. 356.

[53] The scientist is likely to direct his efforts to working on those problems which he feels have a fair chance of being solved, on which he feels he can

make progress. See Peter Medawar: *The Art of the Soluble*, Penguin, Harmondsworth, 1969.

[54] Heuvelmans: op. cit., 1968, p. 205.

[55] Richard Owen: *The Life of Richard Owen*, John Murray, London, 1894, 2 vols., Vol. I, p. 334.

[56] B. Dixon: *What is Science For?* Penguin, Harmondsworth, 1976 pp. 183-199.

[57] R. Grimshaw and P. Lester: *The Meaning of the Loch Ness Monster*, Centre for Contemporary Cultural Studies, University of Birmingham, 1976, pp. 27-30.

[58] ibid., pp. 31-6.

[59] Westrum: op. cit., 1977a and b.

[60] Fortunately anomalous events of various kinds are rapidly being catalogued by specialised societies and a number of popular periodicals. One such society is the International Fortean Organization, 7317 Baltimore Avenue, College Park, Maryland, 20740, U.S.A. Another excellent resource is the systematically arranged *Sourcebooks* of William Corliss, of which nine have so far been published. For details write to Sourcebook Project, Glen Arm, Maryland, 21057, U.S.A.

[61] Nigel Walker: *Crimes, Courts and Figures*, Penguin, Harmondsworth, 1971.

[62] E. C. Hughes: 'Good People and Dirty Work', in H. S. Becker (ed.): *The Other Side: Perspectives on Deviance*, Free Press, New York, 1964, pp. 23-36.

[63] S. Barlay: *Aircrash Detective: An International Report on the Quest for Air Safety*, Hamish Hamilton, London, 1969, 120-143.

[64] Anonymous: 'The News Doctors', *Newsweek*, 25 November 1974, p. 87.

[65] H. Wilensky: *Organizational Intelligence*, Basic Books, New York, 1967.

[66] Westrum: op. cit., 1977a.